1. INTRODUCTION

Think of a portal as *your* view of interesting and relevant information. A portal is an electronic gateway that offers easy access to online resources through a personalized home page that collects the links, headlines, and business applications most relevant to you. Enterprise portals are intended to be one-stop information shopping to support communities of knowledge workers who share common goals.

> A portal is a single, integrated point of comprehensive, ubiquitous, and useful access to information, applications, and people.

As we become increasingly reliant upon electronic resources, portal technology is going to become essential to NASA's ability to conduct its business. Why? Simply put, the ironic consequence of the explosion of available information is that it is becoming harder to find relevant information easily.

When NASA was smaller, and methods of publication were much more limited, it was relatively easy to collect, index and offer for distribution important information. A NASA employee could go to a technical library and be reasonably sure she was finding all information relevant to her query, usually in printed journals, books, or diagrams.

With the growth of the NASA organization and the advent of the Internet—with its ability to make every user a publisher—the search for information has become more complex. Who has the information? Has it been translated from hard copy into electronic format? In either format, has it been absorbed into a central collection? Is the information accessible from a user's desktop computer, or must a physical trip be made to access it? If the latter, is the information available at the user's Center in any form? Will online information require access to specific software? If so, has that software become obsolete?

These questions become even more complex considering the diversity of NASA's audiences. To use the model developed by the eNASA Team[3], NASA's audiences can be formed into four communities:

- Public (including general public, news media, students, and educators)
- Employees

---

[3] More information on eNASA can be found at http://enasa.ksc.nasa.gov

- Partners and suppliers (including contractors and international partners)
- Virtual teams (including contractors, civil servants, and academic institutions)

Each of these audiences is seeking different kinds of information. Even when pursuing information on the same topic, members of the difference audiences will want information in different formats (e.g., press releases versus scientific papers) or at different levels of detail (processed data sets versus factual summaries for use in schools).

As an added complication, an individual can easily become a member of more than one community, depending on the kind of information being sought. For example, a NASA civil servant may be an employee early in the day, so as to check online financial data about his project; the switch to Virtual Teams to attend a weekly tag-up about the project; move to Partners & Suppliers to check progress on parts coming in for systems test later in the week; and finish the day as member of the Public, searching for educational-oriented material on a different NASA project that he can hand out to his child's class the following day.
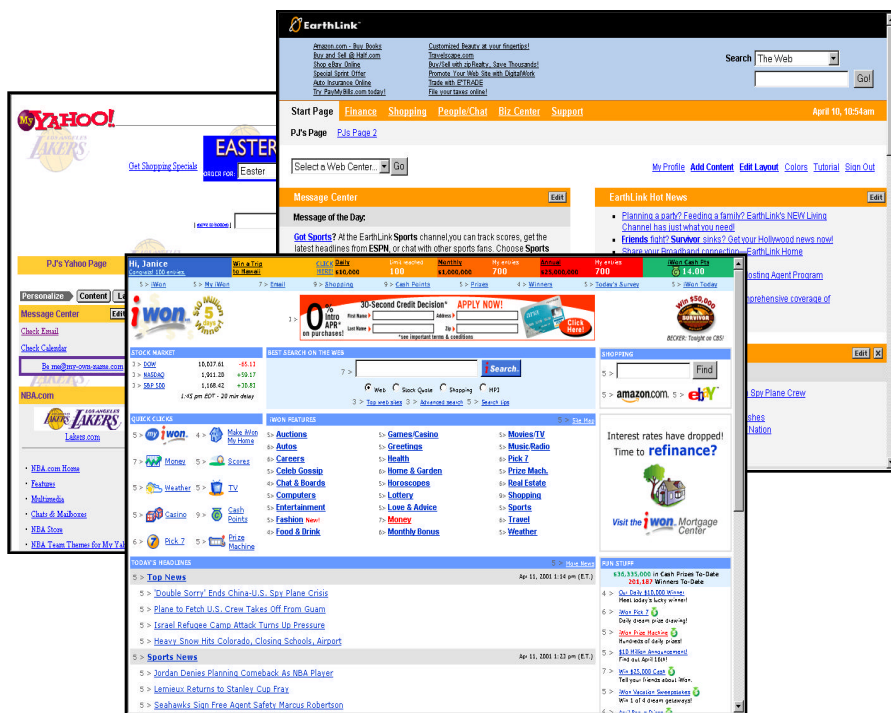

Figure 1. Examples of commercial portals include MyYahoo, MyEarthlink, and MyMSN.

A. WHY ARE PORTALS IMPORTANT TO NASA?

When fully implemented, including all the underlying technology and process efforts described in the previous section, a portal can do the adjusting among different kinds of information and different audience members:

- **Faster dissemination**. Through content management, data can be made available to all its audiences as quickly as the content-owner chooses to do so. Approvals and appropriate controls (for privacy or export control, for example) can be obtained through automated processes, saving time and, as economists phrase it, "shoe leather costs."

- **Faster search and retrieval**. Through metadata and information architecture, data can be described in a commonly accepted format. This will facilitate quick searches among the wide NASA resources for relevant information. It can even allow personalization agents to suggest to users that they look at resources they might find very useful, perhaps heading off a problem before it arises.

- **Faster information creation**. Combing information architecture with a modular system design allows new information to be easily incorporated into the portal with much less reformatting than would otherwise be required. It can also allow the portal to access and distribute information residing in legacy systems, saving the cost of perpetual reformatting.

- **Secure access**. Through access control, a user can be identified and access immediately granted to all the information to which she is entitled: financial data on her project; limited public data on other projects. This can eliminate the need for redundant control mechanisms and multiple passwords.

- **Enables a collaborative environment for knowledge management and sharing**. The ultimate objective of knowledge management is to give the power of collective expertise to each and every team member, allowing us to deliver the greatest value to our customers, the public, industry, academia, and government. In a world where speed of change, learning, and adaptation are critical touchstones of success, knowledge management is an essential capability (Figure 2). Knowledge management has to with the capture, organization, storage, and distribution of intellectual assets. It has to do with people—their learning, collaboration, and creativity. Knowledge management facilitates the reuse of proven resources and methods, reduces costly mistakes, and enables rapid absorption and diffusion of new ideas—allowing NASA and our customers to communicate more effectively.

- **Promotes customization of only relevant data to each audience**. This approach will also greatly enhance the customer experience by remembering the user's preferences and

presenting content according to those preferences on the users next visit. A user will also be allowed to set up an account with MSFC to deliver requested information, similar to a myExcite web page.

- **Decreases the possibility of out-dated information**. Calendaring allows content providers to determine when content is presented on the site and when it is removed. Automating this process ensures that date-sensitive information is available only while relevant.

Business Intelligence
Identifies trends and patterns in structured data for developing new business strategies

Knowledge Management
Captures, stores, organizes, and distributes organizational knowledge and resources (unstructured data)
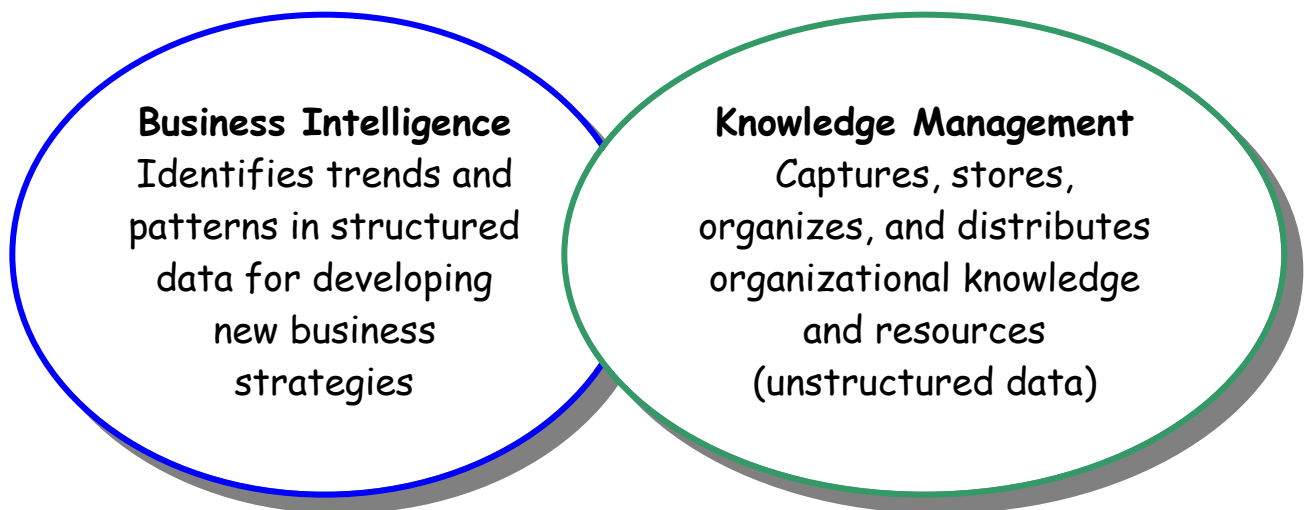
Figure 2. Enterprise information portals represent the integration of business intelligence and knowledge management technologies (adapted from Firestone, 1999).

B. WHAT DOES A PORTAL DO?

A portal is an information tool, most often using Internet technology (TCP/IP communications, web browser interface, and back-end databases) that presents a user with a single point of entry into a heterogeneous information space. Often, a portal allows users to pick and choose from a variety of information sources and "remembers" those choices upon the user's subsequent visits. Underlying an effective portal are a) creation and maintenance of relevant, interesting content; b) an efficient search tool, ideally capable of extracting information from a variety of formats and legacy systems; and c) a foundation information architecture—a system of describing the information that makes relevant data easy to find.

Some of the portal functionality can be categorized as:

- **Information Catalog Management.** Portals must provide a mechanism to organize content into categories meaningful to users (e.g., a category tree similar to Yahoo).

- **Content Management.** As portals grow in scope, content sources proliferate. Content management becomes critical, particularly since content dynamically flows into the portal in near-real time. The ability to manage this content becomes an important shared portal service.

- **Repository Management.** Portal frameworks must incorporate a repository to store information, as well as support access to information stored in file systems and other repositories (e.g., report servers, doc stores).

- **Metadata Management.** Beyond the content itself, metadata has become a critical linchpin to assist organizations in applying a taxonomy over large collections of information.

- **Personalization Engine.** Portals deliver a unique user interface by establishing customized navigational structures, content, and application interfaces.

- **User Profile/Membership Management.** Going hand-in-hand with personalization, profile management will enable users to set wallpaper backgrounds, localization parameters, and other characteristics. These personalization characteristics will be available to other applications and services plugging into the portal.

- **Activity Tracking.** Monitoring on-site behavior enables recommendation engines to suggest other information and application interactions based on explicit and implicit associations made while users traverse a site.

- **Access Control.** Authentication and access controls are essential portal underpinnings. Users should expect a single sign-on capability as they interact with the spectrum of applications, content, and services available through the portal.

C. RETURN ON INVESTMENT

The ROI to NASA will be largely realized in increased efficiencies and enhanced safety and mission success. Although dollar amounts cannot be placed on safety and mission success, the returns obviously are of paramount importance to the Agency. Although difficult to quantify, monetary savings would result from increased efficiencies and decreased duplication of effort. However, the key benefit will result from increased communication and access to data thereby enhancing safety and mission success.

If a portal allows a civil servant making $40,000 annually to spend one hour less each week searching for information and turn that time to more productive use, then over a year $1,000 in NASA payroll will have been put to better use. While this does not

> **The expected ROI for a portal could occur in as little as 1 year of operation.**

constitute direct cost savings, if a portal can cause similar shifts to occur across the Agency's civil service and contractor work force, NASA will be redirecting hundreds of thousands or even millions of dollars annually from unproductive activity to substantive work.

D. CURRENT NASA PORTAL EFFORTS

There are several portal efforts underway or in operation at the Agency. This paper looks at the integration, specifically, of those called MyNASA, InsideNASA, and the Mission PI. More globally, efforts have been made to look at the SAP technologies available through IFMP

The intent is to provide a framework for other portal developers to build upon, while pushing for interoperability with existing or developing portal activities (such as the Technology portal from Code R and the efforts in IFMP) (Figure 3).

Figure 3. Concepts of Agency-wide portals, and NASA portals in actual use, give a flavor of what InsideNASA and MyNASA could look like.
Technology Portal: **http://nasatechnology.nasa.gov/index.cfm**
InsideNASA: **http://eis.jpl.nasa.gov/~jedutra/insidenasa** *and* **http://www1.msfc.nasa.gov/ENASA/**
PBMA Knowledge Management System **http://pbma.hq.nasa.gov/pbmamaster.html**